

REMARKS

The Office Action dated January 11, 2005, has been received and reviewed.

Claims 1-14 and 18-24 are currently pending and under consideration in the above-referenced application. Claims 7 and 9-12 have been allowed. Each of claims 1-6, 8, 13, and 18-24 stands rejected.

It is proposed that claim 8 be canceled without prejudice or disclaimer.

Reconsideration of the above-referenced application is respectfully requested.

Allowed Claims

The allowance of claims 7 and 9-12 is gratefully acknowledged.

Double Patenting Rejection Under 35 U.S.C. § 101

Claim 8 stands rejected under 35 U.S.C. § 101 as reciting the same invention as that to which claims 5-12 of prior U.S. Patent 6,322,634 (hereinafter “the ‘634 Patent”) are drawn.

It is proposed that claim 8 be canceled without prejudice or disclaimer, which would render the 35 U.S.C. § 101 double patenting rejection of claim 8 moot.

Rejections Under 35 U.S.C. § 112, First Paragraph

Claims 1-6 and 18-24 stand rejected under 35 U.S.C. § 112, first paragraph, for allegedly reciting subject matter that is not adequately described in the above-referenced application. In particular, the Office objects to the recitation “with no discernable boundary between the integral edge and a remainder of the at least one shallow trench isolation structure.” Final Office Action, page 2.

The exact language recited in the claims need not be found verbatim in the originally-filed specification to be supported by the originally-filed specification. M.P.E.P. § 2173.05(f) (which applies to 35 U.S.C. § 112, second paragraph, indefiniteness rejections, provides “[t]here is no requirement that the words in the claim must match those used in the specification disclosure.”)

It is respectfully submitted that the specification and drawings of the above-referenced application provide an adequate written description for a structure in which there is no discernable boundary between at least one shallow trench isolation (“STI”) structure and its integral ledge. Specifically, Figs. 7-10 and paragraphs [0020] and [0021] of the above-referenced application describe an example of a process by which an STI structure and its integral ledge are formed from a single layer of isolation material 122. The isolation material 122 is deposited over a semiconductor substrate 102 and within at least one shallow trench 112 formed in the semiconductor substrate 102. Fig. 7; paragraph [0020]. The isolation material 122 is then removed down to a buffer film layer 106 that overlies the semiconductor substrate 102, forming an STI structure 126 that includes integral ledges 130. Fig. 8; paragraph [0021].

As the *entire* STI structure 126, including its integral ledges 130, are formed from the same layer of isolation material 122, there could not be a discernable boundary between the ledges 130 and the remainder of the STI structure 126.

As such, it is apparent that the specification of the above-referenced application provides an adequate written description of an example of an STI structure “with no discernable boundary” between a ledge and the remainder thereof. Therefore, independent claims 1 and 18 comply with the written description requirement of the first paragraph of 35 U.S.C. § 112. Accordingly, withdrawal of the 35 U.S.C. § 112, first paragraph rejections of independent claims 1 and 18, as well as the rejections of claims 2-6 and 19-24 depending respectively therefrom, is respectfully requested.

Rejections Under 35 U.S.C. § 102

Claim 13 stands rejected under 35 U.S.C. § 102(b).

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single reference which qualifies as prior art under 35 U.S.C. § 102. *Verdegaal Brothers v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Mandelman

Claim 13 stands rejected under 35 U.S.C. § 102(b) for reciting subject matter which is purportedly anticipated by that described in U.S. Patent 5,521,422 to Mandelman et al. (hereinafter “Mandelman”).

Mandelman describes (at col. 5, lines 3-23) and illustrates (in FIG. 4c) a precursor to a semiconductor device structure that includes a semiconductor substrate 10 with trenches 16 formed therein. The trenches 16 of the semiconductor substrate 10 are lined with a thermal oxide 34, as are areas of the active surface of the semiconductor substrate 10 that are located adjacent to the trenches 16. STI structures 18 fill the remaining space within the trenches, and include corner dielectrics 22c that extend laterally over regions of the active surface of the semiconductor substrate 10 that are located adjacent to the trenches 16. The thermal oxide 34 prevents the STI structures 18a and their corner dielectrics 22c from contacting any portion of the semiconductor substrate 10; the STI structures 18a and their corner dielectrics 22c instead contact the thermal oxide 34 that lines the trenches 16 and regions of the active surface of the semiconductor substrate 10 that are adjacent to the trenches 16.

Independent claim 13 is drawn to an intermediate semiconductor device structure that includes a semiconductor substrate with at least one trench formed therein, and a trench isolation structure within the at least one trench. The trench isolation structure also extends laterally over and contacts a portion of the active surface of the semiconductor substrate adjacent to a trench corner.

As Mandelman does not expressly or inherently describe an intermediate semiconductor device structure that includes a trench isolation structure that extends laterally over and contacts a portion of the active surface of a semiconductor substrate adjacent to a trench corner, Mandelman does not anticipate each and every element of independent claim 13. It is, therefore, respectfully submitted that independent claim 13 is drawn to subject matter that, under 35 U.S.C. § 102(b), is allowable over the subject matter disclosed in Mandelman.

Morita

Claim 13 is also rejected under 35 U.S.C. § 102(b) for being directed to subject matter which is allegedly anticipated by the subject matter described in U.S. Patent 5,506,168 to Morita et al. (hereinafter “Morita”).

Morita discloses several embodiments of STI structures, most of which include a central region 3 that fills a trench 2, as well as a separately formed spacer 5 that extends laterally over regions of the active surface of a semiconductor substrate 1 that are located adjacent to the trench 2. *See, e.g.*, FIGS. 6, 7, and 9. As these spacers 5 are fabricated separately from the central regions 3 of the STIs, a discernable boundary will be present between the spacers 5 and the central regions 3.

Moreover, in the STI embodiments that are depicted in FIGS. 6, 7, and 10 of Morita, a silicon oxide film 11 separates the spacers 5 from the active surface of the semiconductor substrate 1.

The only embodiment of an STI that includes an integral laterally extending ledge is shown in FIG. 72. More specifically, FIG. 72 of Morita shows an intermediate semiconductor device structure that includes a semiconductor substrate 1 with at least one trench 2 formed therein, silicon oxide films 11 and 36 lining the active surface of the semiconductor substrate 1 and the surfaces of the trench 2, respectively, and a silicon nitrogen film 37 filling the at least one trench. *See also*, col. 13, lines 19-26. As FIG. 72 clearly depicts, the surface of the silicon nitrogen film 37 tapers at the edges thereof.

In addition to requiring that the ledges of an STI structure contact an active surface of a semiconductor substrate, independent claim 13 also requires that the at least one shallow trench isolation structure have a substantially flat surface. As none of the STI structures disclosed in Morita includes *both* of these requirements, Morita does not anticipate independent claim 13. As such, it is respectfully submitted that, under 35 U.S.C. § 102(b), the subject matter to which independent claim 13 is drawn is allowable over the subject matter described in Morita.

In view of the foregoing, withdrawal of the 35 U.S.C. § 102(b) rejections of claim 13 is respectfully solicited.

Entry of Amendment

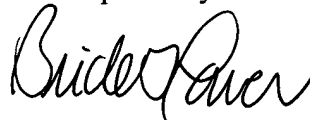
It is respectfully requested that claim 8 be canceled, as proposed. This amendment would not introduce new matter into the above-referenced application or necessitate an additional search. Further, cancellation of claim 8 would reduce the number of issues that remain in the above-referenced application for purposes of appeal.

In the event that a decision is made not to enter the proposed claim amendment, entry thereof upon the filing of a Notice of Appeal in the above-referenced application is respectfully requested.

CONCLUSION

It is respectfully submitted that each of claims 1-7, 9-14, and 18-24 is allowable. An early notice of the allowability of each of these claims is respectfully solicited, as is an indication that the above-referenced application has been passed for issuance. If any issues preventing allowance of the above-referenced application remain which might be resolved by way of a telephone conference, the Office is kindly invited to contact the undersigned attorney.

Respectfully submitted,



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